Conceptual Model of Smart Tailor Architecture for Garment Industry

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Abstract

Smart Tailor is an architecture that integrates various stakeholders such as tailors, designers, and customers in a garment industry. The architecture provides the ability to promote, manage and fulfill supply and demands of their product via electronic ways. Currently, the implementation of the related transaction processes is done manually which may cause time consuming and inefficiency in fulfilling the supply and demands of the garment products. Therefore, this paper aims to construct a conceptual model of Smart Tailor Architecture. This study adopted the first phase of the Rational Unified Process approach, Inception, by identifying the goal of the conceptual model and the verified requirements of the Smart Tailor architecture. Then, the verified requirements were transformed into the Smart Tailor components using the Unified Modeling Language approach. Finally, the verified components by experts become a conceptual model of the Smart Tailor Architecture. The model may contribute to the garment industry stakeholders as well as researchers, decision makers, and software developers.

Keywords— *Smart Tailor, Conceptual Model, Garment Industry, Rational Unified Process*

1. Introduction

The introduction of smart devices particularly, smart phones, has triggered the development of smart applications to ease the daily operations of individuals. This type of application provides new ways of interaction between consumers and business providers. Currently, there are considerable growing numbers of smart applications in various fields such as banking, tourism, healthcare, transportation, wireless blood pressure (BP) monitor, route planning, and ridesharing. Most of these applications are commercially available and can be download from mobile application distribution architectures for free or purchase [1-3].

Smart Tailor is an architecture that integrates various stakeholders such as tailors, designers, and customers in a garment industry. The architecture provides the ability to promote, manage and fulfill supply and demands of their product via electronic ways. Currently, the implementation of the related transaction processes is done manually which may cause time consuming and inefficiency in fulfilling the supply and demands of the garment products. Currently, the implementation of the related transaction processes is done manually which may consume more time and may be inefficient in fulfilling the supply and demands of the garment products.Therefore, to remain competitive, a new way of conducting the tailor service/business needs to be identified. Using mobile technology, a smart tailor application can facilitate the process of the tailor/dress making industry. This is in-line with the recommendation made by Malem [4] that further research is required to consider innovation and entrepreneurship in the fashion design industry. With the introduction of smart infrastructure and devices, the way of providing businesses and services will evolve through various sophisticated applications. Furthermore, the demand of the smart applications is anticipated to rise due the declining cost of smartphones and the growing number of smartphone and Internet users [2]. Thus, there is a need to construct a conceptual model of a Smart Tailor architecture using an information technology mechanism to ensure that the garment industry can be more competitive and marketable in a more systematic and effective way so that the Malaysian government's aspiration towards becoming a developed nation can be realized.

2. Smart Application

Smart applications are designed and developed to enable people to share information, utilize services of each other, and participate as components [5,6]. As the internet technology evolves, the connectivity is no longer solely on people and people to people but is progressing towards connecting objects, places, things and everything that could benefit from being connected in producing smart services architecture [1]. For example, there are various available smart-home technologies that are readily accepted by older adults and their family members, healthcare professionals and carriers that aim to facilitate and improve the quality of life of the elderly, be it at individual homes or nursing institutions [1,7,8,9].

2.1 Tailoring Industry in Malaysia

In Malaysia, it has been a custom for the Malay females to seek for customized clothing service offered by home-based tailor especially in sewing traditional attires. In fact, most of the time, a family will have their own preferred tailor since they have already bonded a trustworthy relationship. However, nowadays, a skillful homebased dressmaker or tailor is hard to find as normally he or she is found through word of mouth recommendation. Furthermore, this type of home-based service is facing several challenges and issues such as competing with the increased number of ready-made dresses vendors. Eventually, this may lead to the termination of their small scale businesses due to limited market since the customers are usually from their neighbourhood. To ensure that such small scale tailoring business can continue to grow and expand, the use of information and communication technology (ICT) is necessary. This is in line with the Malaysian government policy as spelled out in the Ninth Malaysia Plan (2006-2010) that emphasize on the implementation of working from home concept to encourage more involvement from women in business activities. Access to internet connectivity will definitely ease dressmakers and tailors to start promoting and expanding their business activities.

Besides, this fashion industry is part of the high value sectors that support a significant number of economies and individual incomes around the world. Therefore, having a smart tailor application can be solution to these challenges particularly to stay competitive in the industry.

Smart tailor application will be an innovative idea that can help individuals to generate more income through the use of Internet. The application helps to improve the demand and production process of the tailor/customized stay competitive in the industry particularly in reducing the time requires by a tailor to deliver and customer to wait for a dress or clothe. In addition, such application helps in optimizing customer interactions, improving operational efficiency and enabling new business models. The application will also provide opportunity for the players in the fashion industry to increase the quantity of their customized products or services and at a reasonably low cost, which represent the key variables for the fashion supply chain [10].

3. Three Tier Architecture

The 3-tier architecture provides numerous benefits such as the ability to extend, modularize, and configure their application, reduce the time to market and cost to integrate new features into the software application, and minimise user effort to integrate into existing infrastructure and application workflows. Furthermore, the 3-tier architecture allows developers to update any technology of each tier without influencing other areas of the application. Therefore, it provides an ease of maintenance of the code base, managing presentation code and business logic separately. This ensures the product is ready to adapt and ready for the future improvement, and the opportunity to redesign the product or application can easily scale up and out the application, add reliability and independence of the underlying servers or services. [13].

4. Methodology

The Smart Tailor application was developed following the steps stipulated in the adopted Rational Unified Process (RUP) methodology [11]. In RUP methodology as shown in Figure 1 below, the processes are structured into set of phases consisting of Phase I (Inception), Phase II (Elaboration), Phase III (Construction), and Phase IV (Transition). However, the identification of the Smart Tailor Architecture was performed in the Inception phase.

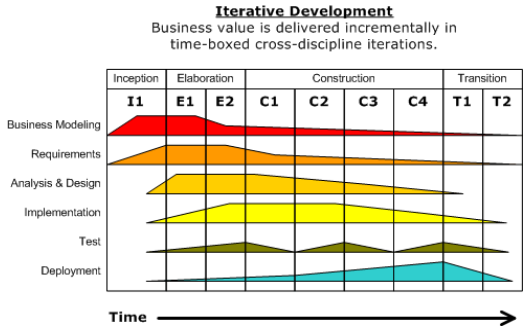
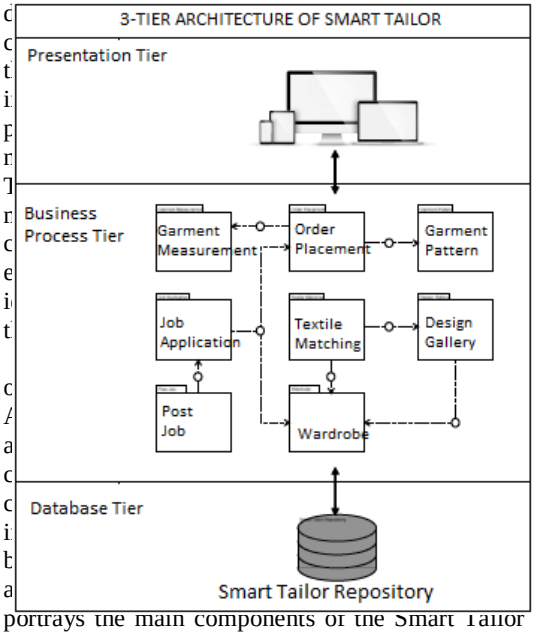


Figure 1. General Rational Unified Process Methodology [11]

During the inception phase, the basic idea and structure of the project is determined. For this purpose, a series of focus group discussions and analyses of literature were conducted in order to define the problem, understand the business model and identify the baseline requirements of the proposed system. The stakeholders of the system and their roles were identified. In addition, current practices, online reports and company profiles were also studied. Next, the requirements of the system are gathered. Subsequently, a list of requirements for the corresponding system was developed and based on the requirements the related use case



portrays the main components of the Smart Tailor Applications and the interaction between components. Finally, the Database tier, that composes of database of the Smart Tailor Application. These three tiers present the whole components of the Smart Tailor Architecture.

5. Components of the Smart Tailor Architecture

The smart tailor architecture is designed based on the generic three-tier architecture as depicted in Figure 2 below. This architecture is comprised of Presentation tier, Business Process tier and Database tier. The following subsections describe each tier of Smart Tailor architecture.

5.1 Presentation Tier

The presentation tier or user services layer comprises of the Smart Tailor Applications. The Smart Tailor Applications are categories into two platforms, the Web-Based Smart Tailor and the Smart Tailor Mobile Apps. The Web-Based Smart Tailor composes of all main functionalities of the Smart Tailor that includes *Post Job* by the garment' owners (customers), *Job Application* by tailors, *Order Placement* by customers, *Garment Pattern*, *Garment Measurement*, *Textile Matching*, *Design Gallery*, and e*Wardrobe*. These functionalities are also developed in the mobile application platform, and are classified into *Garment Apps*, *Tailor Apps*, and *Customer Apps*. Each application allows users to interact with the Smart Tailor engine in the Business Process tier. The details of the process for each functionality or components are discussed in the Business Process Tier.

Figure 2. Smart Tailor 3-Tier Architecture

This tier allows garment owners (customers) to post job or also known as job offer, the apps is classified as *Garment Apps*, meanwhile the tailors can view and choose the job offer post by the companies, and keeps all the ready-made garments into the wardrobe, these mobile apps are classified as *Tailors Apps*. The wardrobe is used to keep all the garment samples by the designers into the wardrobe. The designers also can keep all their design patterns into the *Design Gallery Apps*. On the other hand, customers can request for various smart tailor services. The Smart Tailor customers are classified in two categories; business and individual customers. These customers can request services through the applications grouped as *Customers Apps*. *Customers Apps* act as an interface between customers and Smart Tailor services. The *Customer Apps* allows customer to make order placement, measures the garment or state the size of the garment, and also can perform

Textile Matching and give a recommendation to the customers. The detail process of each Smart Tailor Apps is discussed in the next section.

5.2 Business Process Tier

The Business Process tier consists of the main functionalities of Smart Tailor application that handle information exchange between a database and user interface. The core business processes of the Smart Tailor application are 'Post Job', 'Job Application' and 'Order Placement'. Those services are specifically developed to assist Smart Tailor customers in dealing with the available Tailors and Designers. Additional services are also provided in this layer such as Garment Measurement, Garment Pattern, Textile Matching, as well as Design Gallery and e-Wardrobe.

Post Job - This component will help customers, particularly the garment owners, to offer tailoring jobs. Customers need to fill-up the 'Add Job Offer' form, and then submit it through the system. The backend matching procedure will process the form to shortlist the registered tailors that fulfil customers' requirements. While waiting for the matched tailors to response, customers can manage their tailoring jobs offered through the 'Edit Job Offer' and 'Delete Job Offer' functions.

Job Application – This component will be used by tailors after the matching procedure delivers notification of new jobs offer that matched the tailors' qualifications. Subsequently, the candidate tailors can view further details of the jobs offered and customers' requirements. The rules of the matching procedure are based on customers' requirements and the Smart Tailor business rules. Among the rules is to check against the in-progress jobs status of the tailor. If the in-progress jobs status do not exceed five jobs, the tailor will be eligible for the job offered. Finally, the tailors can choose whether to accept or reject the jobs offered.

Order Placement – This component will be activated when the jobs offered by customers through the *Job Post* are accepted by the tailors that matched the requirements. Customers are required to select or choose the potential tailors and fill up the job's agreement through the Order Placement application. Details of the *Order Placement* include jobs, price, and duration. This component may be linked to the other components such as *Garment Measurement*, *Garment Pattern*, *Textile Matching* or *Design Gallery* which are included as extra services in the Smart Tailor application. If customers wanted to use the *Design Gallery*, they need to deal with the designer regarding the selected design. Once the tailors start the assigned jobs, the details about the job will be updated into tailors' profile and the status on the job will be recorded as 'in-progress'. The status needs to be updated by customers when the tailors finished the tasks. The customers are also required to give feedback or comment and indicate the star rating regarding the tailors' performance. This information is important since the tailors' updated profiles will be used in the next matching procedure for the upcoming jobs offering.

Garment Measurement - This component assists in getting the body measurement of the Smart Tailor customers. The application requires the customers to upload their photos through mobile application to be processed and converted into body measurements. Appropriate and suitable size will be determined according to the standard conversion table stored inside the Smart Tailor database. The Garment Measurement will be integrated with the customers' order function in the *Order Placement* component when they want to proceed with the jobs offering selected by respective tailors.

Garment Pattern - This component aims to assist and automate the production of customized pattern for odd-size customers. The application will produce a customized design pattern, that match the customer's body shape with the chosen garment design pattern. It requires specific measurements for the selected design, and the customer's measurements. To get the customer's measurements, an unedited 3D image of the customers will be used to estimate the required measurements. Based on the estimated measurements, a customizing algorithm will be applied to produce the suitable garment pattern.

Textile Matching – This component helps Smart Tailor customers to choose and decide on the appropriate garment designs based on the specific textile or fabric materials. The application will provide a list of matching alternatives that match up the textile or fabrics to the designs stored in the *e-wardrobe* and *Design Gallery* applications. Hence, the customers can have an idea on the look or appearance of their garment design that will be sewed by their selected tailors. The *Textile Matching* will be integrated with the *Order Placement* component if the customers are not sure

to match the suitable fabric materials to the right design.

Design Gallery – In this component, the registered designers will create designs based on various fashion categories that will be posted and stored in the Smart Tailor database. Moreover, customers can also vote and rate on the designs as well as give their comments and opinions regarding the designs. Designs with highest votes (likes) will be kept as one of the collections in a database called *Design Gallery*. This application will help designers to determine the most promising designs for commercialization. This function will ease the designers know which are the most favourite design.

eWardrobe – This components act as an extra service for all Smart Tailor users (customers, tailors and designers). The tailors and designers can use this *eWardrobe* to keep all their ready-made garments if they want to sell it to the customers. The customers also can buy the ready-made garments through this *eWardrobe*.

5.3 Database Tier

The third layer is related to data repository of the Smart Tailor Application. Data objects for a Smart Tailor application are defined in Database Management System (DBMS). Different users in Smart Tailor architecture have different roles such as customers, tailors, designers or administrator and every role has their own authorities in accessing Smart Tailor data and business logics. Users can access the Smart Tailor Web or Apps based on their access level.

Requests are transferred to the Business Process which contains business logics that processes Smart Tailor transactions and services. Configuration of data model for Smart Tailor Repository means the ability to add, delete, and update data object. The administrator can access DBMS of the Smart Tailor and manage data model. Additionally, the Smart Tailor administrator can configure access authority of role sets for each data model and data field based on accessed levels authority. Figure 2 also shows the relationship among all the Smart Tailor components.

5.4 Conclusion

The main objective of this paper is to construct a conceptual model of Smart Tailor architecture using three-tier architecture. This paper was adopted the first phase of the Rational Unified Process approach, called as Inception Phase. The first tier comprises of the presentation layer of the Smart Tailor application or also known as user interface layer of the Smart Tailor Apps. The second tier composed of the Smart Tailor main components based on the list of requirements, *Post Job* and *Order Placement* by garment owners, *Job Application* by tailors, and extra services for Smart Tailors users such as *Garment Measurement*, *Garment Pattern*, *Textile Matching*, *Design Gallery*, and *eWardrobe*. The 3-tier architecture of the Smart Tailor may allow ease of maintenance of the Smart Tailor source code, managing the presentation code and business processes separately. This ensures the Smart Tailor Application is ready to adapt and ready for the future improvement, such as the opportunity to redesign the Smart Tailor application and integrating new technology into the application.

In sum, this study can realize the innovation on garment industry by integrate all stakeholders in one smart architecture. The user can interact with the services provided using either web-based or mobile application which is available to be downloaded and installed on their laptops or smartphones. The project will bring garment industry a change from order-oriented to service-oriented, and promote competitiveness and smart level. Moreover, it also enables garment industry's information integration and technique innovation, meet the needs of all industry ecosystems and come up with an integrated smart solution.

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